

Terriculous Oligochaeta (Glossoscolecidae) of the Venezuelan Llanos

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Terriculous Oligochaeta (Glossoscolecidae) of the Venezuelan Llanos.-

From the Venezuelan Llanos in Barinas State seven Glossoscolecidae species are recorded. The genus *Anteoides* Cognetti is reevaluated and differences between all known species are emphasized. *Anteoides kino* n. sp., *Cirodrilus venezuelanus* n. sp., *Glossodrillus guahibo* n. sp. and *Glossodrillus cornutus* n. sp. are described. Important morphological variations are recorded in *Diaguita vivianeae* Righi.

Key-words: Oligochaeta - Glossoscolecidae - Taxonomy - Venezuelan Llanos.

INTRODUCTION

Studies upon Oligochaeta have increased during the last years due to its practical significance (fertilization and conservation of the soils) allied to its academical importance (reconstitution of the zoological history of the world - Phylogeny and Zoogeography). Nevertheless, the knowledge of the neotropical earthworms is still fragmentary due to species richness and great diversity of biotopes; so that just now there are not yet secure earthworm records from the Venezuelan Llanos.

Working under the orientation of Prof. Wilfredo Franco (Universidad de los Andes, Mérida, Venezuela) one of us (Saul Molina) collected earthworms from May 1987 to March 1988 in the Ticoporo Forestal Reserve (7°43' - 8°12' N by 70°36' - 70°53' W), a part of the Venezuelan Llanos in Barinas State. The collecting area is named "Unidad II" and it is from 100-150 m above sea level occupying an area of 40,775 ha. It is limited at east, south and west by the Michay, Suripá and Quiú rivers respectively, which flow from the Andean Cordillera. The mean-annual temperature is 27°C; there are two well-demarcated seasons, a dry-season (January to March) and a rainy-season (April to December), and the mean-annual rainfall is 2,078 mm. The collecting localities are the following:

Locality A - clayish oxic dystropepts soil with Verbenaceae, *Tectona grandis* (teak tree) plantation since 1973.

Locality B - clayish oxic dystropepts soil with Pinaceae, *Pinus* sp. (pine tree) plantation since 1971.

Locality C - typic clayish tropaquepts soil of heterogeneous forest with Boraginaceae, *Cordia alliodora* (pardillo tree) prevalence since 1976.

The soil characteristics follow Soil Survey Service (1960). The worms were fixed in ethanol - formol - water mixture (7:2:1). The studies were made by dissections, slides of microscopical pieces mounted in glycerin - water (1:1) and serial microscopical sections (10 µm) stained by Mallory's triple method (PANTIN, 1964). The figures were made with camera lucida. The material is deposited in the Department of Zoology - University of São Paulo (ZU) and in the Muséum d'Histoire Naturelle, Genève (MHNG).

Anteoides Cognetti

Anteoides Cognetti, 1902: 4; 1906: 165; 1907: 798; MICHAELSEN, 1918: 247; CORDERO, 1945: 3; JAMIESON, 1971: 733. Type species *A. rosai* Cognetti, 1902.

DIAGNOSIS:

Setae, 8 per segment disposed in regular series or some regular and others irregular. Dorsal pores present or absent. Intraclitellar male pores. Four pairs of calciferous glands of ventral origin in VII-X structured by longitudinal trabeculae. Intramural calciferous tissue of juxtaposed transverse lamellae. Testes in XI without testis sacs. Seminal vesicles long, extending through several segments, or short, restrict to XII in athecal species. Ovaries in XIII. Spermathecae present or absent.

SPECIES AND OCCURRENCES:

A. rosai Cognetti, 1902 - Argentina: Jujuy Prov.: San Lorenzo. Bolivia: Santa Cruz Dept.: Aguajrenda (COGNETTI 1902; 1906; 1907).

A. desartsi Cognetti, 1907 - Paraguai: Puerto Max on the river Paraguay (Cognetti 1907; MICHAELSEN 1918).

A. pigy Righi, 1982 - Brazil: Pará State: Amazônia-Tapajós National Park (RIGHI 1982).

A. kino, n. sp. - Venezuela: Barinas State: Ticoporo Forestal Reserve.

REMARKS:

1. *Anteoides* belongs to the group of *Perolofius* Righi & Nemeth (1983), *Diachaeta* Benham (1887), *Cirodrilus* Righi (1975) and *Periscolex* Cognetti (1905) characterized by calciferous glands of trabecular structure. *Perolofius* has 8 pairs of glands in VII-XIV; *Anteoides* 4 pairs in VII-X; *Diachaeta* 3 pairs in VII-IX; *Cirodrilus* 2 pairs in VIII-IX and *Periscolex* 1 pair in VII. *Perolofius*, *Anteoides* and *Cirodrilus* have only one pair of testes in XI whereas *Diachaeta* and *Periscolex* have two pairs in X-XI. The setae have lumbricine disposition excepting some *Periscolex*

species that increase the number of setae per segment up to a perichaetine arrangement.

2. Differentiated genital setae are found only in *A. kino*. The other *Anteoides* species may have some clitellar setae bigger than the other ones; but they are alike in shape.

3. Dorsal pores occur in the clitellar and some post-clitellar intersegments of *Anteoides kino*; the pores are absent in the other three species.

4. *Anteoides rosai* and *A. desartsi* have not spermathecae and their small botryoidal seminal vesicles are restricted to XII. The seminal vesicles are long, extending far back by penetration of the successive septa up to XX in *A. kino* and up to XL-L in *A. pigy*.

5. The four known *Anteoides* species live in the overflowing lowlands that extend mid longitudinally in South America, from the northern part of the Llanos in Venezuela to the southern region of the Chaco in Argentina. One abnormal very macerated specimen from Caracas (Venezuela) was doubtfully assigned to *Anteoides* by OMODEO (1955).

TABLE TO *Anteoides* SPECIES

<i>Anteoides</i>	<i>rosai</i>	<i>desartsi</i>	<i>kino</i>	<i>pigy</i>
setae arrangement	regular series	regular series	regular series	regular and irregular series
setae ornamentation	semilunar excavations	semilunar excavations	aemilunar excavations	thorns on the convex side
mid-body aa : ab : bc	5.0 : 1.0 : 8.4	8.0 : 1.0 : 9.0	5.0 : 1.0 : 7.5	1.4 : 1.0 : 1.2
Genital setae	undifferentiated	undifferentiated	differentiated	undifferentiated
Clitellum	XIV - XXI	XIV - XXI	XIV - XXII	XVII - XXXII
Male genital field	puberal ridges in 1/4 XVII - 1/4 XIX	glandular rings in XVII or XVIII	puberal furrows in XVIII - XIX	puberal furrows in 1/n XXV - XXVII
Male pores	XVIII	XVII or XVIII	XVIII	25/26
Spermathecae	absent	absent	7/8 - 9/10	6/7 - 8/9
Hearts	VII - XIII	VII - XIII	VII - XIII	VII - XI

Anteoides kino n. sp. (Figs. 1-8)

M a t e r i a l : Locality B, depth 0-10 cm, 1 clitellate specimen (Holotype, ZU-1277).

DESCRIPTION:

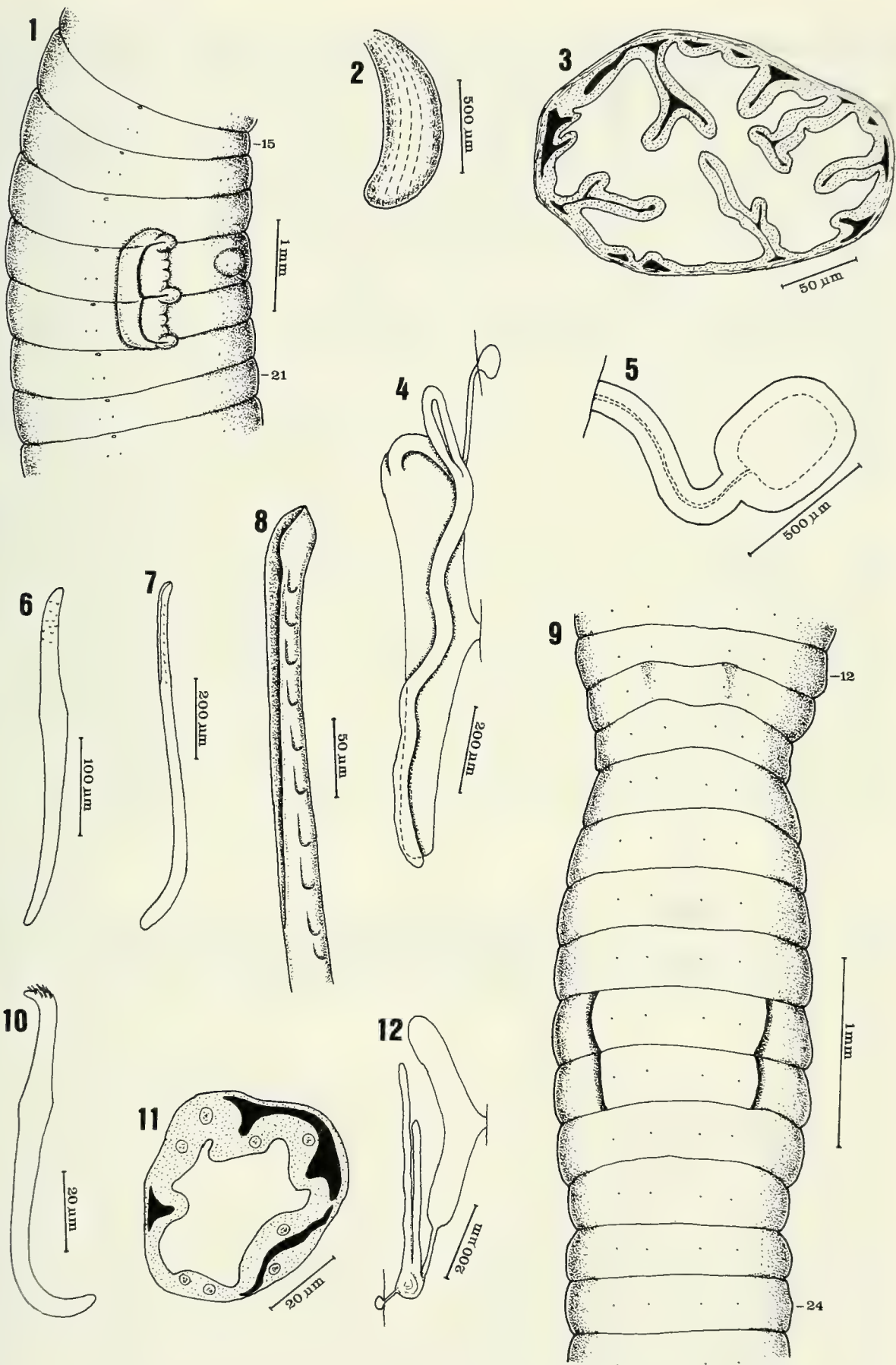
Length 62 mm. Mid-body diameter 2.7 mm. Colour whitish. Number of segments 135. The tentacular prostomium invaginated in the oral cavity is as long as I-1/2 III; its longitudinal musculature is continuous with that of IV. The basal half of the

prostomium is separated from the buccal cavity by a semicircular sheath. The setae are disposed in 4 pairs of regular lengthwise series from II onwards. The setal relations are in the middle-body region (segments L-LX) $aa : ab : bc : cd : dd = 5.0 : 1.0 : 7.5 : 1.0 : 20.5$ ($ab = 160 \mu\text{m}$) and in the posterior region (CXX-CXXX) $= 3.3 : 1.0 : 4.5 : 0.8 : 13.5$ ($ab = 180 \mu\text{m}$). The common setae (Fig. 6) are sigmoid almost straight with a distal nodulus and unicuspidate apex; their apical 1/6 presents numerous semilunar excavations opened towards the apex and out of alignment. The setae's length varies in the mid-body from 281-353 μm ($M = 310 \mu\text{m}$) and in the posterior region from 296-363 μm ($M = 322 \mu\text{m}$). The left *a* and *b* setae of XVII and the right ones of XVIII are transformed into genital setae (Fig. 7). They are slightly sigmoid, more curved in the proximal 1/4, and get thinning up to a slight apical enlargement. The distal 1/3 of the convex side has a lengthwise groove; which becomes deeper towards the apex (Fig. 8); one margin of the groove is regular and the other one is slightly lowered just before the apical enlargement. The narrow spatulate apex has slightly prominent angles. At the sides of the groove there are two alternate series of semilunar excavations; there are 8-10 excavations per series. The genital setae's length varies from 849-874 μm . The clitellum extends on XIV-XXII (= 9 segments) without well-defined margins. Milk-white, little prominent, egg-shaped papillae contain every couple of genital setae. A pair of E-shaped puberal furrow (Fig. 1) lies in XVIII-XIX (= 2 segments) in the dorsal half of *bc*, on a milk-white, little prominent, rectangular area. Small egg-shaped thickenings contain the three tips of the puberal E. The two puberal areas are associated with two rectangular fields of gland cells; which are little prominent in the body cavity of 1/2 XVII-XIX. The male pores open in the posterior half of XVIII, inside the lengthwise arm of the puberal furrows. Female pores were not seen. Three pairs of spermathecae open in 7/8-9/10, line *c*. The nephridiopores are in *cd* just after the intersegments. The first dorsal pore is in 12/13; the pores are well seen in the clitellar intersegments and some posterior ones, but they are unrecognizable in the greater number of intersegments.

The septa 6/7-11/12 are thick, muscular and disposed like interpenetrated cones; the 7/8-9/10 are the thickest; the other septa are slender and fragile. The pharyngeal bulb extends ventrally to the level of the parietal segment V and dorsally to VI. The long anterior oesophagus is bent across as a tightened S. The wide rounded and very muscular gizzard lies in VI but, due to its size and septa's shape, it corresponds to the parietal segments VII-1/2 VIII. There are four pairs of calciferous glands in VII-X; they open into the oesophagus close to its mid-ventral line and ascend laterally beyond the oesophagus. The glands are sack-like, curved and voluminous (Fig. 2). Their structure is made of longitudinal trabeculae of different

FIGS 1-12

Anteoides kino n. sp.: 1 - Lateral view of the segments XV-XXI. 2 - Calciferous gland of X. 3 - Cross section of a calciferous gland of IX. 4 - Nephridium of XL. 5 - Spermatheca of 9/10. 6 - Mid-body seta. 7 - Genital seta of XVII. 8 - Apex of the same. *Cirodrilus venezuelanus* n. sp.: 9 - Ventral view of the segments XII-XXIV. 10 - Mid-body seta. 11 - Cross section of a calciferous gland of VIII. 12 - Post-clitellar nephridium.



length; in cross sections some trabeculae are simple and others branched (Fig. 3). The oesophagus presents strong intersegmental constrictions setting apart segmental chambers in XIII-XVII. The side walls of the chambers in XIII-XVI make a lot of high and very vasculose cross lamellae (= intramural calciferous tissue). The oesophageal mucosa of XVII forms some low lengthwise folds. The transition oesophagus-intestine is in 17/18. The typhosolis begins in XXII. It is a thick dorsal blade as high as half intestinal diameter. There are no intestinal caeca. The dorsal blood vessel is moniliform from XVII forwards in a zigzag course over the oesophagus. There are three pairs of thin lateral hearts in VII-IX and four pairs of thick intestinal hearts in X-XIII. One subneural vessel is recognized in the clitellar segments. There is one pair of holonephridia on each segment. The nephridia of VI and anterior ones are gathered at the sides of the oesophagus. In the post-clitellar nephridia (Fig. 4) the loop I is twisted or not and turned downwards. The loop II follows the inner edge of the loop III (= bladder) ending far away. The wide duct to the bladder has not glandular differentiations. One pair of testes and seminal funnels lie in the cavity of XI full of spermatozoa. The pair of silvery tubular seminal vesicles make some irregular turns around the oesophagus and intestine up to XX. The thick vas deferentia run on the body wall in 1/2 *bc* up to 1/2 XVIII where they pierce the parietes. The pair of laminar ovaries and female funnel are in XIII. The three pairs of spermathecae are alike one another in VII-IX. Each spermatheca (Fig. 5) has a somewhat flattened quadrangular ampulla full of spermatozoa and one little longer duct. Ampulla and duct have thick walls but there are not seminal chambers or diverticles.

The name of the new species was taken from the Indian group "Kinó" belonging to the Arawak.

***Cirodrilus venezuelanus* n. sp.**

(Figs. 9-12)

M a t e r i a l : Locality A, depth 0-10 cm, 1 clitellate specimens (Holotype, ZU-1278).
Locality B, depth 0-10 cm, 2 clitellate specimens (MHNG-987.485).

DESCRIPTION:

Length 24-26 mm. Mid-body diameter 0.9-1.0 mm. Number of segments 87-136. There are not pigments. The prostomium and the segment I are invaginated in the three worms; the prostomium is a voluminous dorsal lobe in the oral cavity. The setae are arranged in 4 pairs of regular series starting from II. The setal relations are in the mid-body (segments XXX-XL) $aa : ab : bc : cd : dd = 1.4 : 1.0 : 1.8 : 0.4 : 6.0$ ($ab = 193 \mu\text{m}$) and in the posterior region (LXX-LXXX) $= 1.5 : 1.0 : 1.6 : 0.5 : 4.2$ ($ab = 167 \mu\text{m}$). The common setae are straight with the ends turned in opposite directions and a small nodulus in the distal third. Their subapical convex side has a group of slender thorns (Fig. 10). The length of the setae varies in the mid-body among 82-97 μm ($M = 84 \mu\text{m}$) and in the posterior region among 61-87 μm ($M = 72 \mu\text{m}$). There are not genital setae. The clitellum lies on XIV-XXII (= 9 segments); it is ring-shaped with a flattened little thick ventral surface. A pair of puberal furrows (Fig. 9) occurs in

1/2 *bc* of XIX-XX (= 2 segments). The genital pores are microscopical. The male pores are in 19/20 inside the puberal furrows and the female ones are in line *a* of 14/15. There are not spermathecal pores. The nephridiopores are intersegmental in the setae's *d* line.

The anterior septa are very thin, fragile and recognized only in histological sections. The first septum well seen in dissection is 12/13. The septa 12/13-14/15 are thick and muscular, the followings are thin. One wide globular and strongly muscular gizzard belongs to segment VI but, due to the elongated shape of the septa, it is on level with the parietal segments IX-X. The oesophagus is very large in VII-VIII; it decreases up to XII and remains uniform backwards. The inner oesophageal surface rises up in very vascular cross lamellae (intramural calciferous tissue) in VII-XI, XII; the lamellae are more numerous in VII-X. Two pairs of calciferous glands open near the mid-ventral line of the oesophagus in VIII-IX. The glands are small pear-shaped and structured by low lengthwise trabeculae (Fig. 11). The transition oesophagus-intestine is in 15/16. There are not intestinal caeca. The typhlosole begins in XX; it is a thick dorsal blade as high as half intestinal diameter. The dorsal vessel is moniliform from XV forwards. Three pairs of thin lateral hearts are in VII-IX and two pairs of thick intestinal hearts in X- XI. The nephridia are one pair on each segment; those of VI and anterior ones are intermingled at the sides of the oesophagus. The post-clitellar nephridia (Fig. 12) are formed by a small pre-septal funnel and a main post-septal part constituted by two loops connected to the ventral end of the bladder. The pair of testis sacs are ventrally melted in XI and laterally they rise up to the ventral 1/4 of the oesophagus. The pair of seminal vesicles extends laterally up to XIV. The vas deferentia run straightforward on the body wall to 19/20. The pair of bulky ovaries attacks post-ventrally to the septum 12/13. There are not spermathecae.

REMARKS:

The genus *Cirodrilus* Righi (1975) contains three species viz. *C. angeloi* Righi (1975) known in Brazil: Amapá State; *C. aidae* Righi (1994) known in Brazil: Paraíba State and *C. venezuelanus*. The three species may be distinguished by the following table.

TABLE TO *Cirodrilus* SPECIES

<i>Cirodrilus</i>	<i>angeloi</i>	<i>aidae</i>	<i>venezuelanus</i>
Setal relations in the mid-body	<i>aa</i> > 4 <i>ab</i>	<i>aa</i> > 4 <i>ab</i>	<i>aa</i> < 1.5 <i>ab</i>
Clitellum	XIII, XIV - XXI	XV - XXIV	XIV - XXII
Male genital field	puberal ridges in XIV, XV - XXI	puberal ridges in XVII - XXII	puberal furrows in XIX - XX
Male pores	posterior in XVI	posterior in XVIII	19/20
Spermathecae	5/6 - 8/9	6/7 - 8/9	absent

***Onychochaeta windlei* (Beddard, 1890)**

Diachaeta windlei Beddard, 1890: 159, pl. 20, figs. 1-15.

Onychochaeta windlei; Righi, 1989: 1079, figs. 39-47.

M a t e r i a l : Locality A, depth 0-10 cm, 2 clitellate and 1 young specimens (MHNG-987.480). Locality B, depth 0-20 cm, 2 clitellate and 3 young specimens (ZU-1260). Locality C, depth 0-10 cm, 1 clitellate specimen (MHNG-987.479).

***Pontoscolex (P.) corethrurus* (Müller, 1857)**

Lumbricus corethrurus Müller, 1857: 113.

Pontoscolex (P.) corethrurus; Righi, 1984a: 163.

M a t e r i a l : Locality A, depth 0-10 cm, 1 clitellate and 4 young specimens (MHNG-987.478). Locality B, depth 0-20 cm, 5 clitellate and 4 young specimens (MHNG-987.482). Locality C, depth 0-10 cm, 6 clitellate and 2 young specimen (ZU-1281).

***Glossodrilus guahibo* n. sp.**

(Figs. 13-18)

M a t e r i a l : Locality A, depth 0-30 cm, 29 clitellate, 1 a clitellate mature and 3 young specimens (Holotype ZU-1279A; paratypes ZU-1279B). Locality B, depth 0-50 cm, 7 clitellate and 1 young specimen (MHNG-987.484). Locality C, depth 0-10 cm, 2 clitellate specimens (MHNG-987.483); all paratypes.

DESCRIPTION:

Length 33-57 mm. Mid-body diameter 1.0-1.2 mm. Number of segments 90-121. There are not pigments. The prostomium, when retracted, is a small lobe in the roof of the buccal cavity; when extroverted it is nearly hemispherical, a little longer than wide. The setae begin in II and are disposed in 4 pairs of regular lengthwise series. The relations among the setae are in the middle body region (segments XXXV-XL) $aa : ab : bc : cd : dd = 17.5 : 1.0 : 3.7 : 1.0 : 20.0$ ($ab = 80 \mu\text{m}$) and in the posterior region (C - CX) $= 12.3 : 1.0 : 3.8 : 1.0 : 8.0$ ($ab = 119 \mu\text{m}$). The common setae (Fig. 17) are sigmoid of distal nodulus and unicuspidate do not ornamented apex; the setae's length varies from 96-129 μm throughout the body. The lateral setae of X are modified into genital setae (Fig. 18). They are almost straight with proximal nodulus; theirs distal 1/3-1/4 is ornamented with small excavations of crenulate margins opened towards the apex and out of alignment. The genital setae's length varies among 344-368 μm . The strong musculature associated to their follicles makes outstanding rectangular structure; which occupies all the segment length. The clitellum lies on segments XV-XXI, XXII (= 7-8) with a little thickened ventral surface in the greater number of specimens. One pair of puberal ridges (Fig. 13) extends from 1/2 XVI-1/2 XVIII. They are wide and little thick; their lateral margin is nearly straight close to a longitudinal furrow in 1/2 *bc* and the curved medial margin is wider in XVII. The mid-longitudinal line of the ridges is in *ab*. In a few number of specimens with clitellum equally thick all around, the puberal ridges are recognized only by a slight difference in tonality and by the limiting lateral furrow. The genital pores are microscopical. The male pores are on the puberal ridges in 16/17 slightly

medial from *a*. The female pores open just in front of the setae *a* in 1/2 XIV. One pair of spermathecal pores are aligned with the setae *c* in 9/10. The nephridiopore are intersegmental in line *b*.

The septa 6/7-10/11 are thick, muscular and like interpenetrated cones; the other septa are thin and flat. The glandular cells of the pharyngeal bulb grow dorsally up to the anterior half of the gizzard. The cylindrical, short, wide and very muscular gizzard lies in VI. The two calciferous glands open side by side into the mid-dorsal line of the oesophagus in XI; the glands are elongated and due to the septa shape they are at level of the parietal segments XII-XIV. Each gland (Fig. 14) is club-shaped with a ventral glandular part of composite tubular structure and a dorsal membranous sac (calciferous reservoir) which opens anteriorly into the oesophagus. The transition oesophagus-intestine is in 14/15. The typhlosole begins at 15/16; in the post-clitellar region it is a dorsal thick blade as high as 1/3 of the intestinal diameter. There are not intestinal caeca. Three pairs of lateral hearts are in VII-IX and two pairs of intestinal hearts in X-XI. There are one pair of holonephridia on each segment. Each post-clitellar nephridium (Fig. 15) presents a small pre-septal funnel and three post-septal loops. The loop I is short and covered by loop II; which is long, folded and makes a tour around the dorsal end of III (= bladder). The duct to the bladder is long, wide and silvery-white. There are not testis sacs, the pair of testes and wide folded male funnels are free in XI which cavity is full of spermatozoa. The pair of seminal vesicles is flattened tubular with intersegmental constrictions and reaching up to XXII-XXVII. The pair of vas deferentia runs straightforward between the setal follicles *a* and *b* up to 16/17. The pair of ovaries and female funnels are in XIII. There is one pair of spermathecae in X. Each spermatheca (Fig. 16) has a somewhat flattened globular ampulla full of spermatozoa and a thin duct as long as 1.5-2 times the greatest ampulla diameter.

REMARKS:

Glossodrilus guahibo has affinities to *G. antisanae* Zicsi (1989) known in Ecuador. The main *antisanae* characteristics to distinguish from the new species are: rectangular puberal ridges ventral to *a* setae; genital setae absent; rounded calciferous gland without membranous sac (reservoir); peri-oesophageal testis sac present.

The new species name was taken from an Indian group nomadic throughout the Llanos.

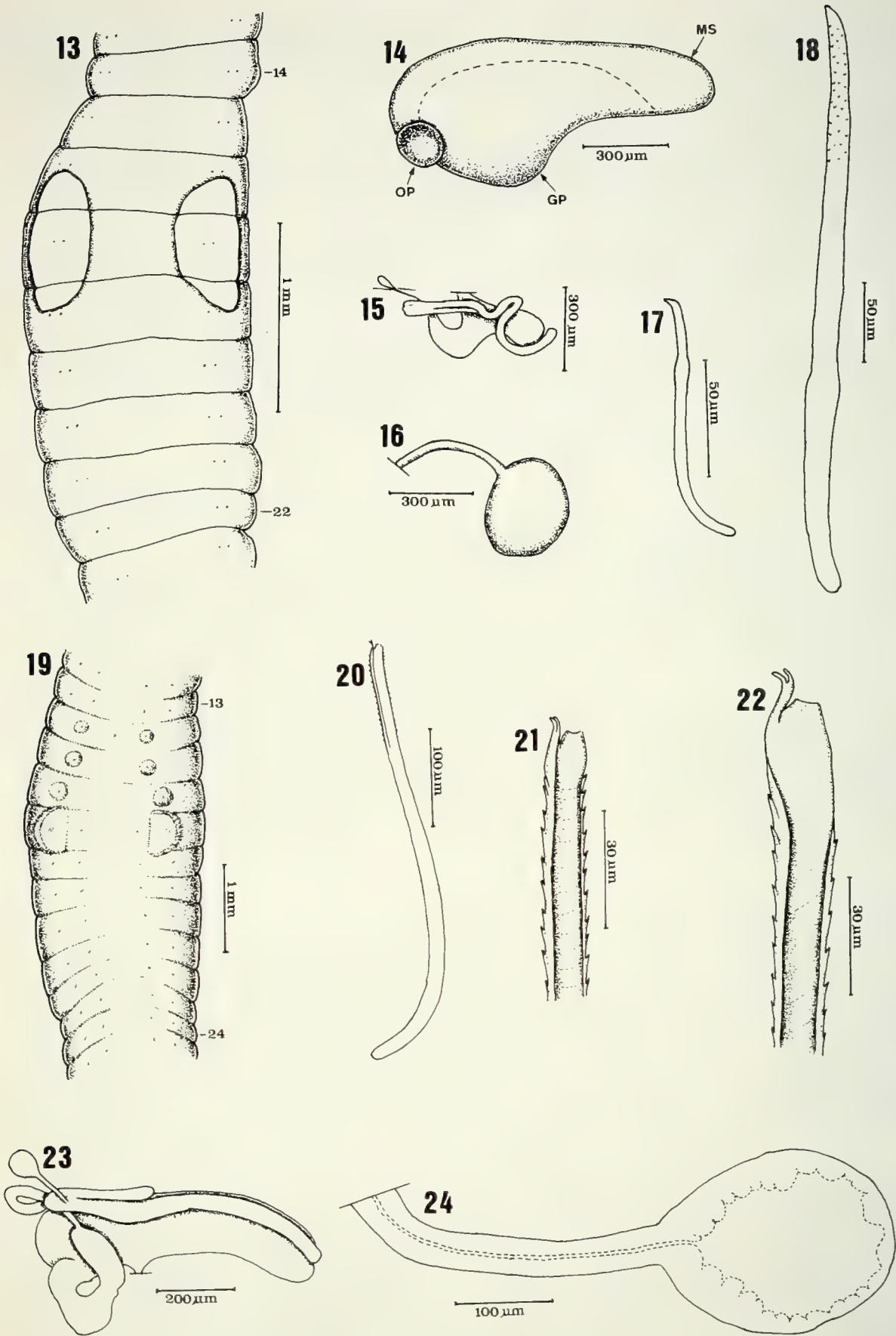
***Glossodrilus cornutus* n. sp.**

(Figs. 19-24)

Material: Locality A, depth 0-10 cm, 2 clitellate and 1 young specimens (Holotype ZU-1280; paratypes MHNG-987.481).

DESCRIPTION:

Length 24-32 mm. Mid-body diameter 1.0-1.4 mm. Number of segments 100-124. Pigments absent. The partially invaginated prostomium is calotte-form as long as



wide. There are 8 lengthwise series of setae beginning in segment II. The setal relations are in the mid-body region (segments LV-LXV) $aa : ab : bc : cd : dd = 2.9 : 1.0 : 1.1 : 1.0 : 2.9$ ($ab = 347 \mu\text{m}$) and in the posterior region (CX-CXX) $= 2.7 : 1.0 : 1.0 : 0.8 : 2.7$ ($ab = 360 \mu\text{m}$). The common setae are sigmate of distal nodulus and unicuspidate apex. The setae's length varies in the mid-body from 118-135 μm ($M = 125 \mu\text{m}$) and in the posterior region from 143-204 μm ($M = 159 \mu\text{m}$). The setae a from XIV-XVI are modified into genital setae 404-419 μm long. Theirs proximal 2/3-3/4 is curved and the distal part straight (Fig. 20). The distal 1/3-1/4 (Figs. 21-22) has a wide lengthwise groove with the outer convex surface ornamented by many low scale-like semicircles. The apex divides in two teeth; one of them is three times wider than the other one. The wide tooth is spatulate with a mid anterior notch; the thin tooth is two times longer, nearly cylindrical, curved and forked. The clitellum extends from XIV-XXII (= 9 segments); it is ring-shaped, thin in the ventral surface and very thick above b line. One pair of semilunar puberal tubercles occupies all segment XVII length from 1/2 ab -1/2 bc (Fig. 19). The tubercles are associated with wide groups of gland cells prominent in the body cavity. Three pairs of conical papillae contain the genital setae of XIV-XVI. Papillae and tubercles are milk-white. The male pores lie in line b of 1/2 XVII on the puberal tubercles. The single female pore is mid-ventral in XIV. One pair of minute spermathecal pores is in line b of 9/10. The nephridiopores are intersegmental in line b .

The septa 6/7-9/10 are thick and muscular, the following ones are thin and fragile. The voluminous conical pharyngeal bulb extends over the anterior oesophagus up to the level of the parietal segment VII. The voluminous, very muscular conic gizzard is wider anteriorly; it belongs to segment VI but, due to the elongated anterior septa, corresponds to the parietal segments VIII-IX. One pair of rounded calciferous gland is dorsal in XII. They have composite-tubular structure without membranous sac (calcareous reservoir) and have a common opening into the mid-dorsal line of the oesophagus in 11/12. The transition oesophagus-intestine is in 14/15. The typhlosole begins in XV; it is a thick dorsal blade as high as 1/2 intestinal diameter. There are not intestinal caeca. Three pairs of lateral hearts are in VII-IX and two pairs of bulky intestinal hearts in X-XI. There is a pair of holonephridia per segment. In the post-clitellar nephridia (Fig. 23) the short loop I achieves just to the nephridiopore level and loop II and III are equal in length. The duct to III is voluminous twisted and milk-white. The pair of testis sacs melts ventrally in XI then rises at the oesophagus sides tapering up to near its mid-dorsal line. The vas deferentia run on the body wall above setae b line up to XVII where they go among the gland cells of the puberal tubercles.

FIGS 13-24

Glossodrilus guahibo n. sp.: 13 - Ventral surface of the segments XIV-XXII. 14 - Medial view of a calciferous gland. 15 - Post-clitellar nephridium. 16 - Spermatheca. 17 - Ventral seta of the mid-body. 18 - Lateral seta of X. *Glossodrilus cornutus* n. sp.: 19 - Ventral surface of the segments XIII-XXIV. 20 - Genital seta of XVI. 21 - Apex of the same. 22 - Apex of a genital seta of XV. 23 - Post-clitellar nephridium. 24 - Spermatheca. (GP - Glandular part. MS - Membranous sac. OP - Opening into the oesophagus).

The seminal vesicles are tubular, somewhat flattened and irregularly folded up to XIII. There are a pair of ovaries and female funnels in XIII and a pair of spermathecae in X. On each spermathecae (Fig. 24) the ampulla is rounded to pear-shaped with thick glandular walls; the duct is a little longer than the greater ampulla diameter.

REMARKS:

Glossodrilus cornutus has affinities to *G. orosi* Righi & Fraile-Merino (1987) known in Costa Rica. They are the only two *Glossodrilus* species with grooved genital setae. The two species may be distinguished by the shapes of the male genital field, of the spermathecae and of the genital setae's apex.

The name of the new species refers to the apex of the genital setae.

Diaguia vivianeae Righi, 1984

(Fig. 25, A-K)

Diaguia vivianeae Righi, 1984b: 207, figs. 23-30; Righi & Guerra, 1985: 154.

Material: Locality A, depth 0-10 cm, 4 clitellate specimens (ZU-1281). Locality C, depth 0-10 cm, 7 clitellate specimens (MHNG-987.477).

OBSERVATIONS:

The species were known only in Brazil: Mato Grosso State. The Venezuelan worms present variations of the puberal markings not yet recorded. The body length varies from 35-125 mm; the mid-body diameter from 2.3-3.5 mm and the number of segments from 77-230. The ring-shaped clitellum extends on XIV, XV-XXII, XXIII (= 9-10 segments); its ventral side is little thickened without the well-demarcated mid-ventral naked area on XIV-XVII, XVIII of the Brazilian animals. The puberal furrows are curved like parentheses from XIX, 1/2 XIX-XX. The 11 examined specimens differ one from another by the number and position of the puberal papillae. The papillae may be paired in VII-X, XV-XVIII, 20/21, XXII-XXIV and single mid-ventral in XI-XIV. The variations are demonstrated in Fig. 25, A-K.

GENERAL REMARKS

Just now there were not any secure record of Oligochaeta species to the Venezuelan Llanos. Seven earthworms are now registered in the "Unidad II" of the Ticoporo Forestal Reserve, viz.: 1. *Anteoides kino*, 2. *Cirodrilus venezuelanus*, 3. *Onychochaeta windlei*, 4. *Pontoscolex (P.) corethrurus*, 5. *Glossodrilus guahibo*, 6. *G. cornutus*, 7. *Diaguia vivianeae*. Six of these species (n° 2-7) inhabit Locality A; five species (n° 1-5) live in Locality B and four species (n° 3,4,5,7) inhabit Locality C. The species poorness in Locality C is probably related with the little aired soil type.

Three species are not significant to the faunistic characterization of the region due to wide geographical distribution. *P. (P.) corethrurus* is a well-known pan-tropical peregrine species. *O. windlei* is known in several regions of Venezuela and in Surinam, Saint Thomas Island, Haiti, Cuba and Bermuda Islands (RIGHI in press). *D.*

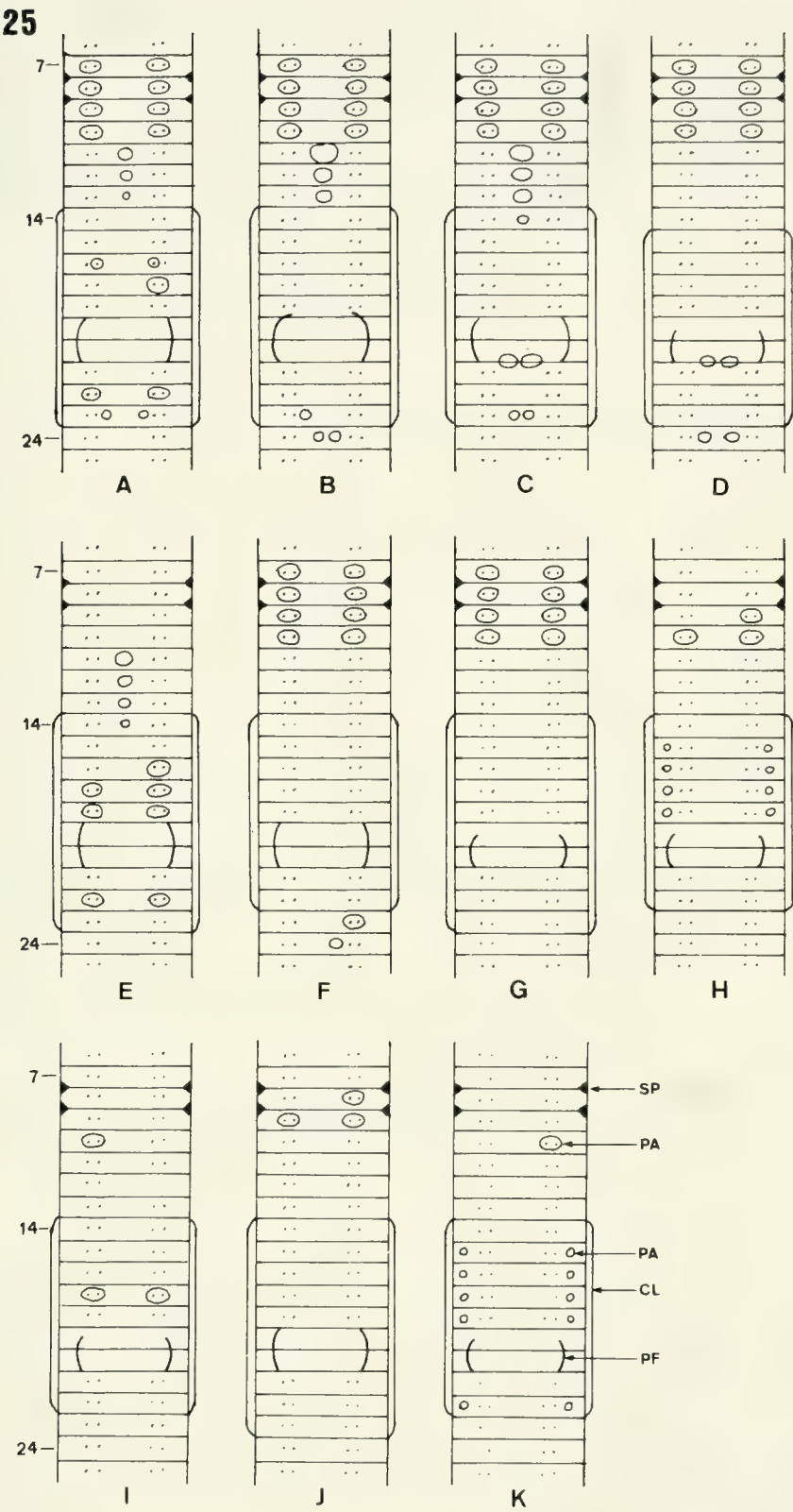


FIG. 25

Diaguia vivianeae Righi: 25, A-K - Variations in the puberal markings of 11 specimens (CL - clitellum. PA - Papilla. PF - Puberal furrow. SP - Spermathecal pore).

vivianeae is also known in the "Pantanal", a part of the "Chaco" in Brazil, Mato Grosso State. *A. kino*, *C. venezuelanus*, *G. guahibo* and *G. cornutus* are characteristic to the studied region. *G. guahibo* is the most characteristic species because it lives in the three sampled localities and from 0-40 cm deep in the soil. The other three species have more restrictive distribution, *A. kino* lives in Locality B, *C. venezuelanus* in Localities A and B, and *G. cornutus* in Locality C, all them in depths from 0-10 cm.

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